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Canberra

I, JANENE PEISKER, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004901445 for a patent by TECHNOLOGICAL RESOURCES PTY LIMITED as filed on 18 March 2004.

WITNESS my hand this
First day of April 2005

JANENE PEISKER
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

TECHNOLOGICAL RESOURCES PTY LIMITED

A.C.N. 002 183 557

Invention Title:

WATER EVAPORATION MINIMIZATION

The invention is described in the following statement:

WATER EVAPORATION MINIMIZATION

Field of the Invention

The present invention relates to the minimization of water evaporation from water and tailings storage facilities, and more particularly to floating water surface cover modules for use in providing a floating barrier which covers a substantial part of the surface of a water storage facility to minimize evaporation.

Background of the Invention

The need to conserve water in many parts of the world to support increasing demands placed on water resources by growing populations competing with environmental requirements is becoming more evident with time. This has fuelled interest in ways to minimize evaporative losses from open storages.

Numerous suggestions to minimize evaporation involving the use of floating objects have been made in the past with different degrees of success and associated problems. While evaporative loss is known to be reduced by covering the surface of the water with a plastic or like sheeting cover, and while such techniques are used with success in swimming pools, such mechanisms have limited success with water storage facilities having large surface areas which are exposed to extreme weather conditions, and particularly high winds.

Other suggestions include the use of floating balls and other floating covers made from plastic sheeting. In a study conducted by one of the present inventors, floating water surface modules which cover most of the surface of the water have been determined to provide a practical solution for large water surface areas, as they are relatively stable in high winds. However, until the present invention, the prototype floating modules used in the study have not been amenable to economic commercial manufacture and distribution.

Summary of the invention and object.

It is an object of the present invention to provide a floating water storage cover module which lends itself to economic mass production.

The invention provides a floating water surface cover module comprising a rim portion and a cover portion, means for giving buoyancy to the module such that in use the rim portion is substantially submerged in the water, said cover portion being configured to define an air space above the water, said buoyancy means including at least one air-filled buoyancy pocket.

By using air-filled buoyancy pocket(s) as the buoyancy means, the module can be molded from a suitable plastics material, or constructed from other suitable material, to enable commercially viable mass production.

The rim and/or cover are preferably configured to allow the modules to be stacked for transportation, thereby simplifying the distribution process.

The cover portion is preferably provided with an air vent to equalize the pressure in said air space between the cover and the surface of the water. The cover portion is preferably at least slightly domed to facilitate water run off while not significantly interfering with stacking.

The rim portion is preferably circular to provide the most efficient coverage according to random stacking theory. While hexagonal, triangular and square profiles could be adopted, the randomness of the deployment of the modules onto the surface of the water means that accurate alignment is difficult to achieve. It has been found that a circular profile achieves a higher consistency of coverage of the surface of the water, and for this reason is preferred. In any event, it is believed to be preferable to leave at least a small part of the water surface exposed to maintain water quality.

The buoyancy means may include a single closed air-filled channel or pipe attached to or forming part of the rim, or a multiplicity of discreet air-filled pockets spaced around the rim. In one form, open pockets can be

formed in the plastic molding of the rim, and cover portion with separate lids being attached to the rim and the cover in such a way as to close the open pockets to thereby form air-filled buoyancy means.

Description of Preferred Embodiments.

In order that the invention may be more readily understood, several preferred embodiments will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective view from above of a first embodiment of a module embodying the invention;

Figure 2 is a perspective view from beneath of the module;

Figure 3 is an enlarged fragmentary sectional elevation showing how two modules are stacked;

Figure 4 is a schematic illustration of an alternative rim and cover configuration;

Figure 5 is a perspective view from above of a stack of modules according to a further embodiment;

Figure 6 is a perspective view from beneath of the module of Figure 5;

Figure 7 is a side elevation of the module of Figure 5, and

Figure 8 is an enlarged fragmentary sectional elevation showing the interrelationship of the rims of the stacked modules of Figure 5.

Referring firstly to Figures 1 to 3 of the drawings, the floating water surface cover module according to the first embodiment will be seen to comprise a rim 1 from which extends a shallow dome-shaped cover 2, in the present embodiment, injection molded as a unitary molding. The cover 2 is formed with a small vent opening 3 which is of sufficient size to allow equalization of the pressure of the air under the cover when the module is immersed in water while not allowing the escape of a significant amount of water vapor.

As illustrated in Figure 2, the module is molded with strengthening ribs 4 extending from the center of the cover 2 to the rim 1.

To provide the module with the required buoyancy, a closed air-filled buoyancy pipe 5 is suitably secured on the inside of the cover 2, the cover being configured and the pipe being positioned, as illustrated in Figure 3, to allow module stacking.

In the embodiment of Figure 4, buoyancy is provided by forming the rim 1 as an open channel 6, the cover 2 being welded or adhesively secured in place to close the channel 6 to provide a sealed air-filled buoyancy cavity. To allow for stacking, the configuration of the rim 1 may be modified to define a suitably stepped or sloping configuration.

Referring now to Figures 5 to 8 of the drawings, the module once again has a rim 1, a shallow domed cover 2 formed with a vent 3, the underside of the module being formed with strengthening ribs 4, as illustrated in Figure 6 of the drawings.

In this embodiment, buoyancy is provided by six shaped air-tight air-filled cavities 5 which are closed at the top by six shaped separate lids 8 attached after molding to create the air-tight cavities 5. To allow for stacking, the cavities 5 are shaped to fit within indentations 7 formed in the cover 2, the rims 1 co-operating in the manner illustrated in Figure 8 when the modules are stacked in the manner shown in Figure 5.

Each module sits in the water W as illustrated in Figure 7 by the suitable selection of the buoyancy provided by the cavities 5. By ensuring that the rim is immersed in this way, the module is less likely to be tipped or otherwise disturbed during high winds.

In a preferred embodiment, the relationship between the height (h_r) of the rim and the depth (χ) of the freeboard portion (proportion not immersed in water)

satisfies the relationship:

$$0.1 \leq \frac{x}{h_r} \leq 0.3 \qquad (1)$$

If the relationship is greater than 0.3, this represents a condition where the bottom of the rim is more likely to come out of the water in rough conditions thereby making the module prone to being caught by the wind. At values less than 0.1, representing a normal water level close to the surface of the cover 2, water may splash onto the cover thereby increasing the water surface from which evaporation may occur.

In a typical embodiment, the diameter to height ratio of the rim ($D:h_r$) and the diameter to height ratio of the domed cover ($D:h_d$) are between 5:1 and 25:1.

The design parameters of the air-tight and air-filled cavities 5 and portions 6 and indentations 7 will be determined by the application of standard buoyancy theory and by subsequent field testing to arrive at a freeboard portion in use according to equation 1.

Since modifications within the spirit and scope of the invention may be readily effected by persons skilled in the art, it is to be understood that the invention is not limited to the particular embodiment described, by way of example hereinabove.

Dated this 18th day of March, 2004

TECHNOLOGICAL RESOURCES PTY LIMITED

By their Patent Attorneys

GRIFFITH HACK

Fellows Institute of Patent and

Trade Mark Attorneys of Australia

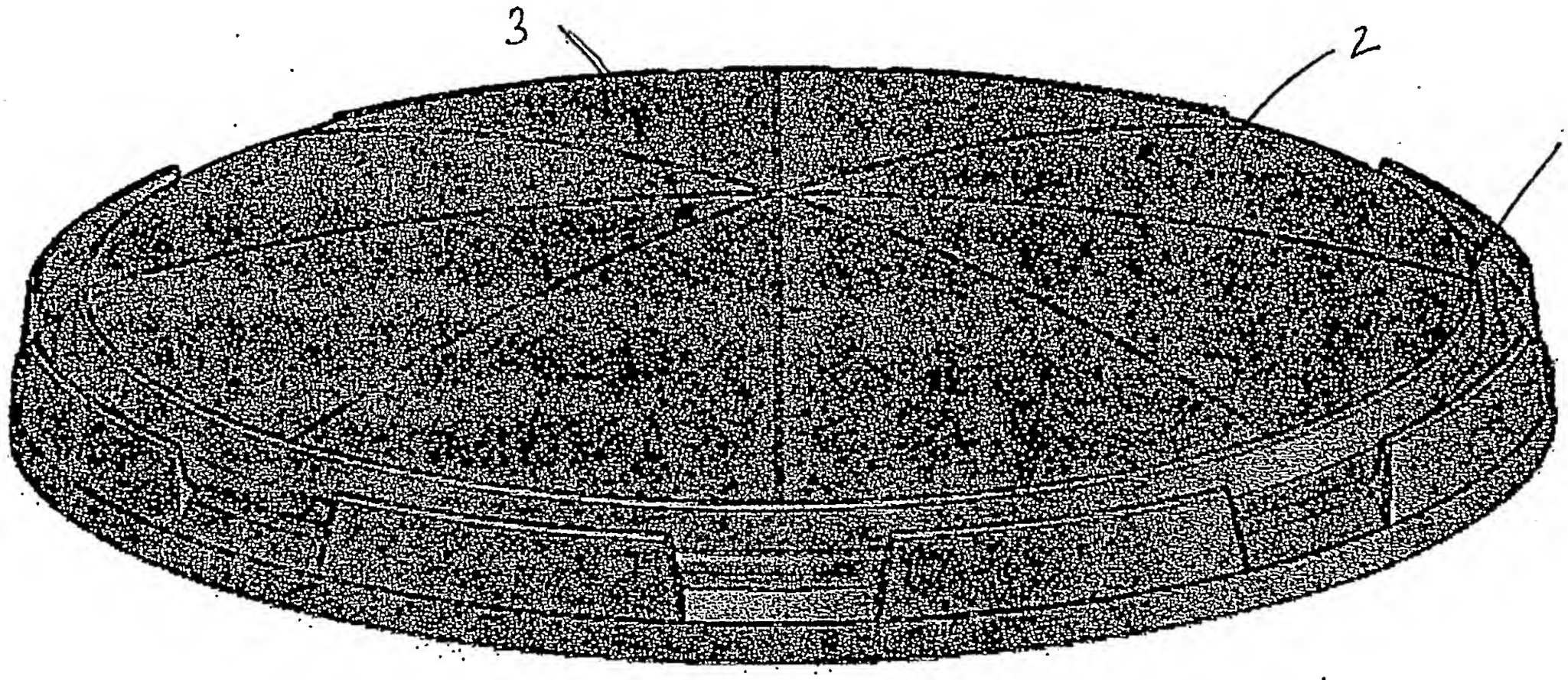

FIG. 1

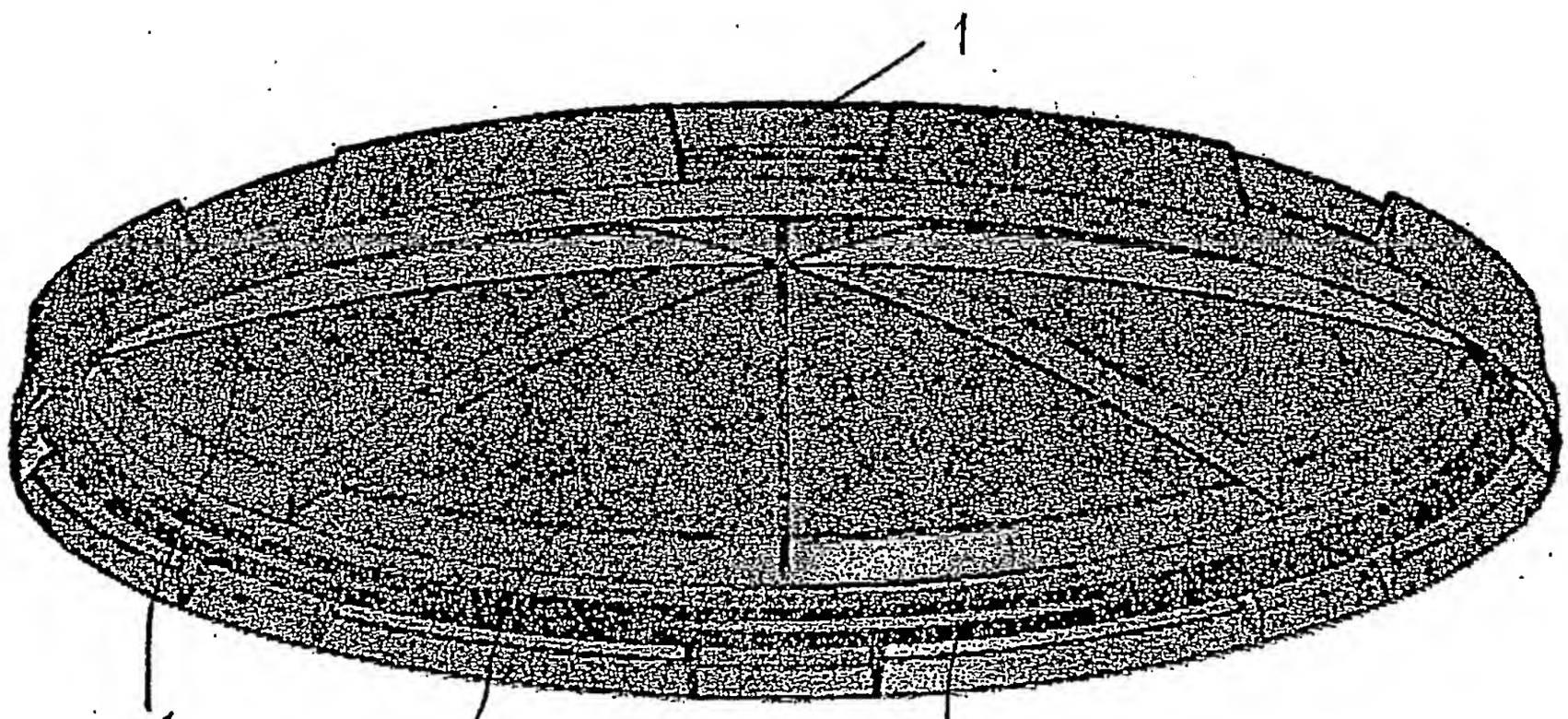

FIG. 2

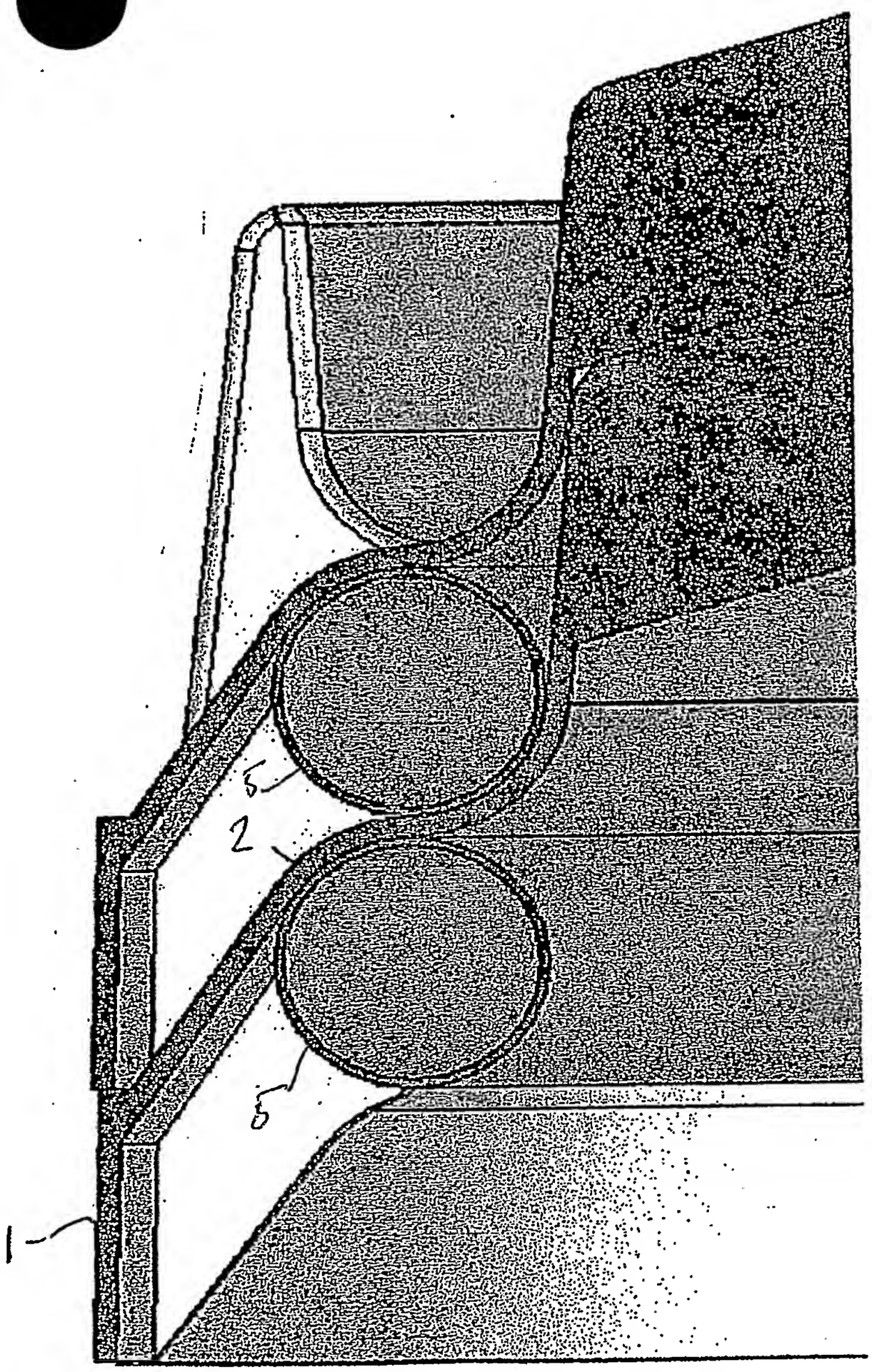

FIG. 3

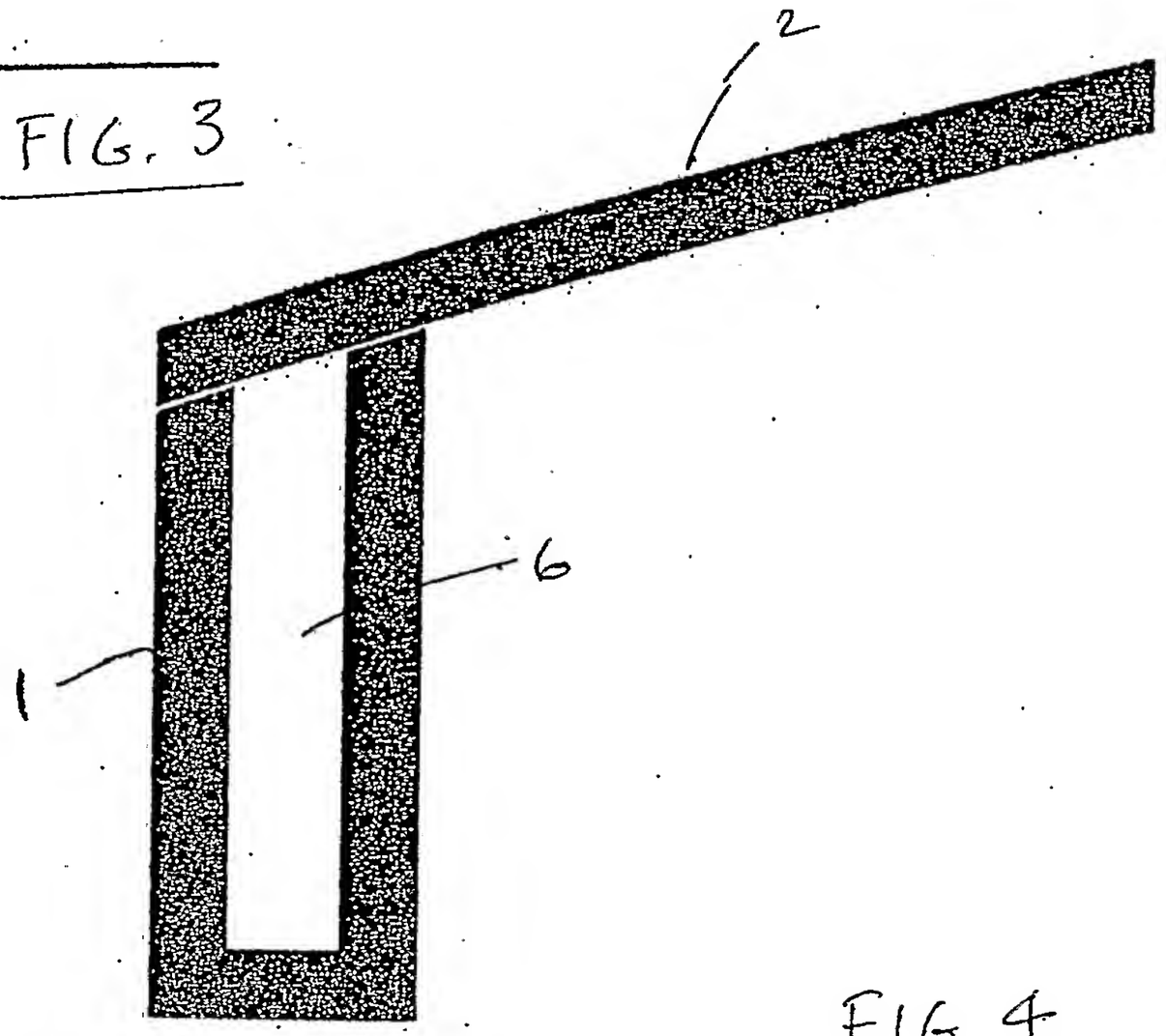

FIG. 4

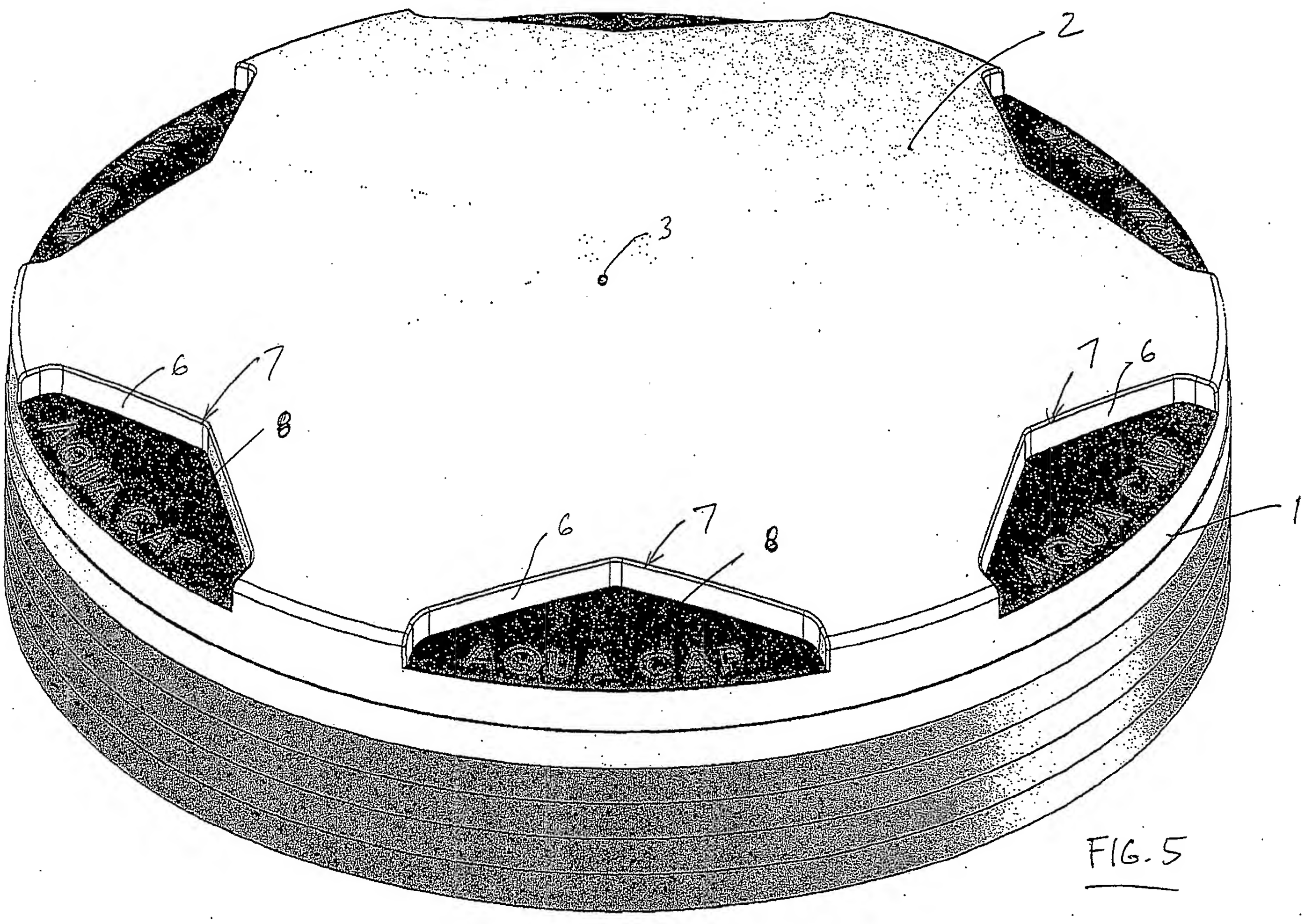

FIG. 5

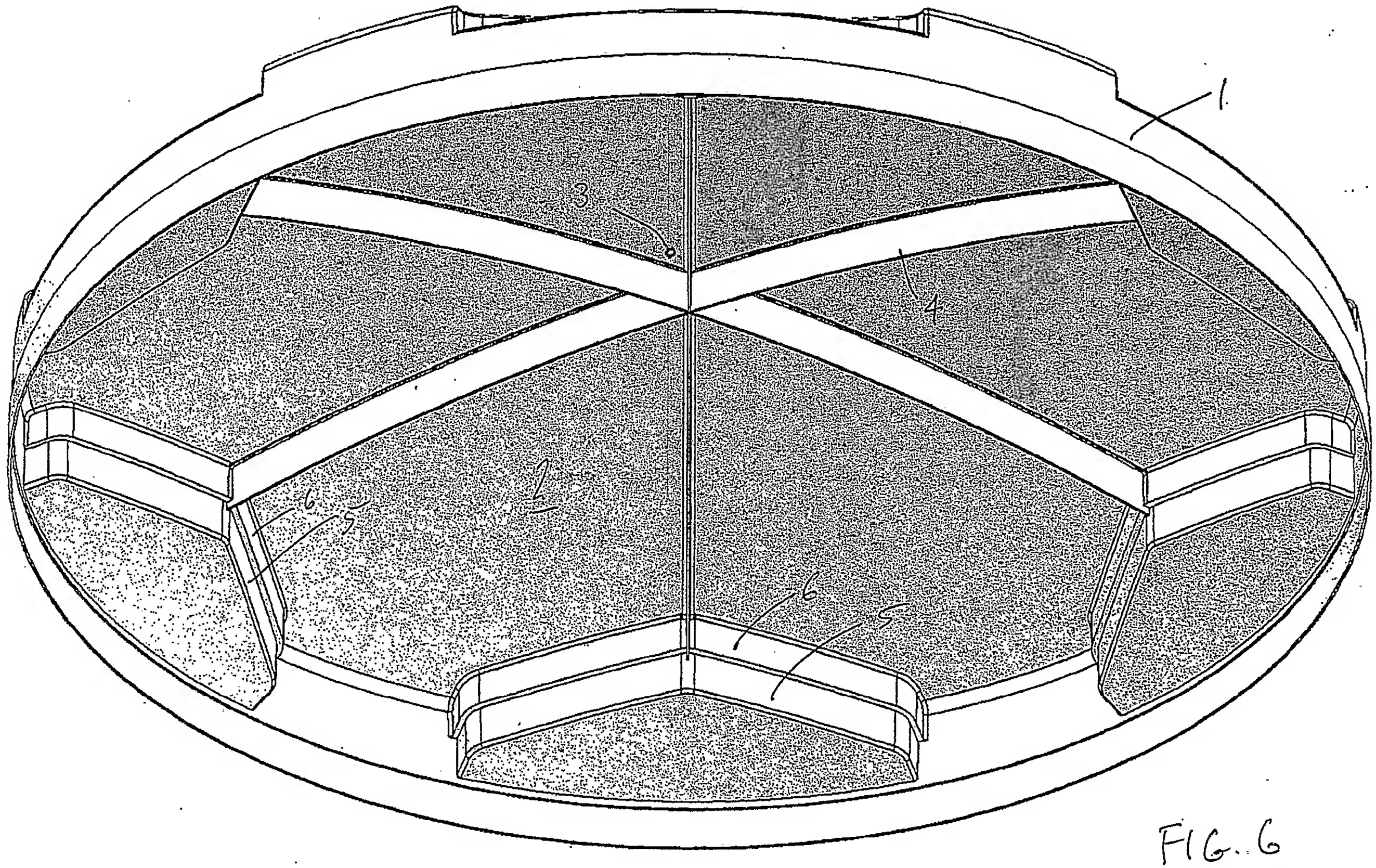

FIG. 6

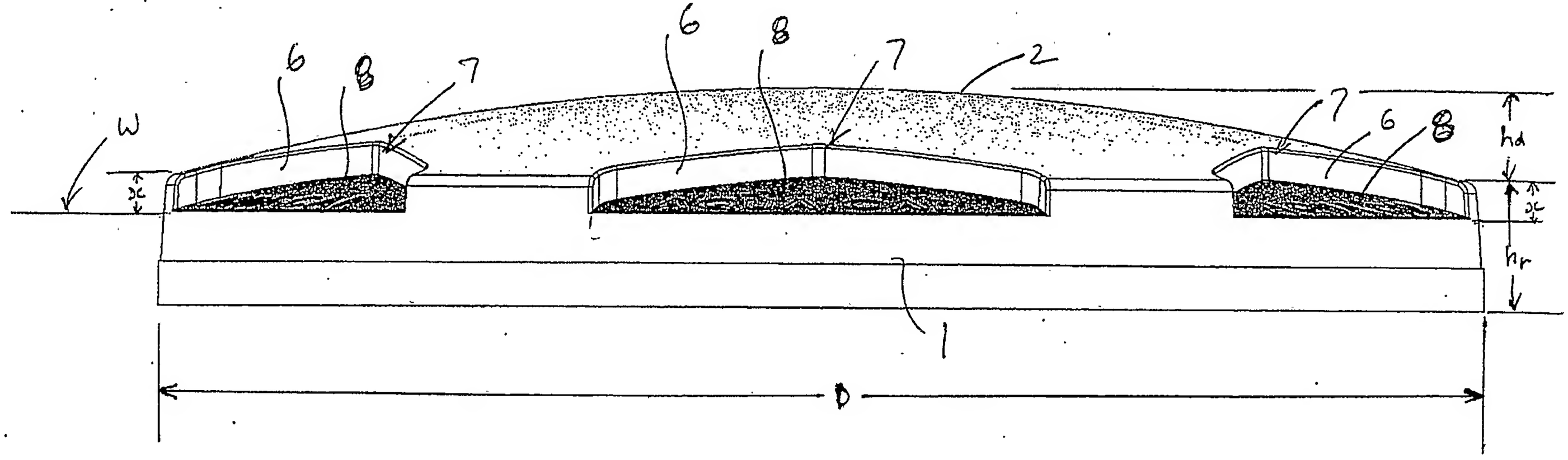

FIG 7

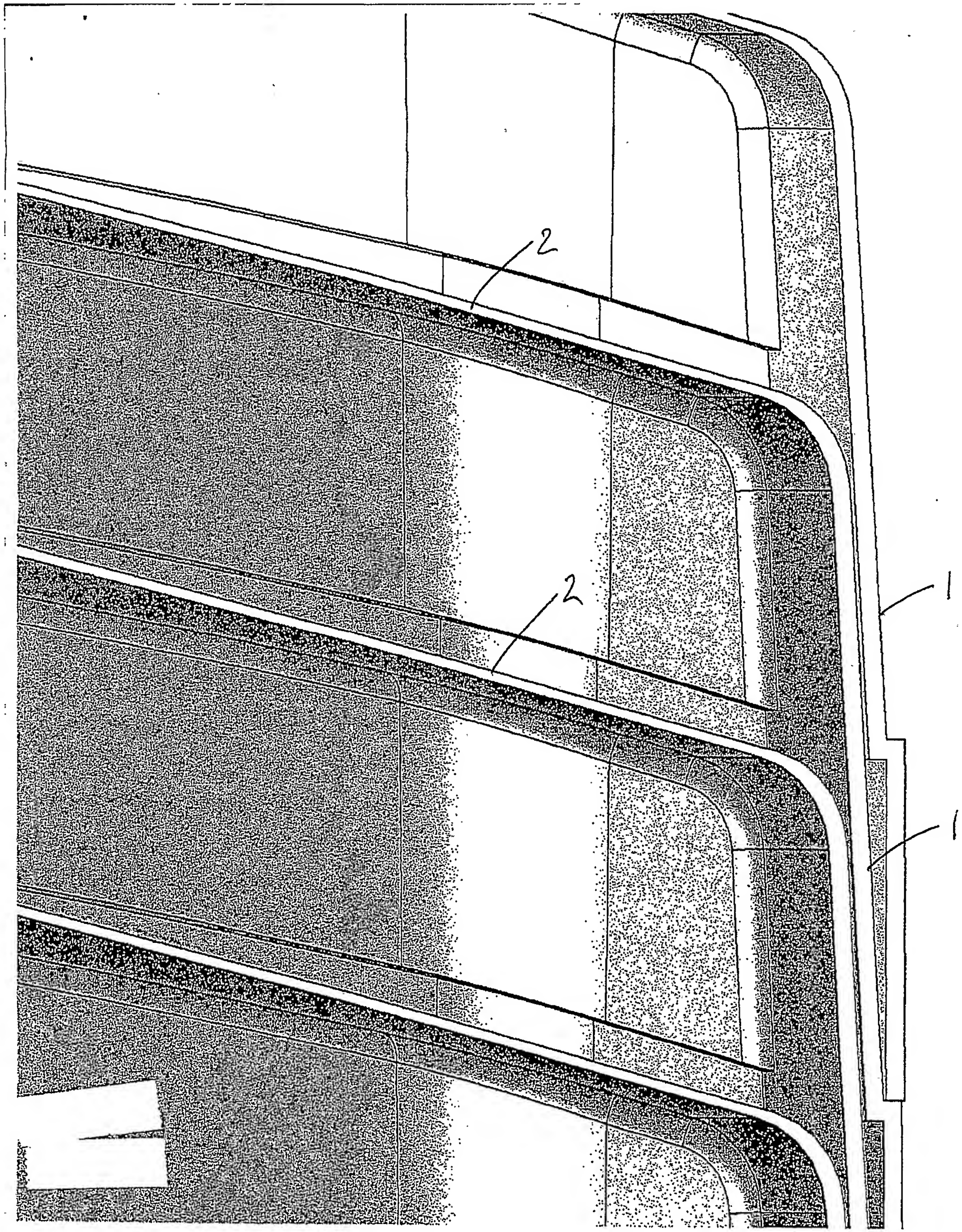

FIG. 8